two magnets disposed adjacent said sensor to produce magnetic fields of opposite polarity along the path of travel for the plurality of magnetically switchable elements; and

wherein as said rotor is rotated, said two magnets cause each of said magnetic elements to be magnetically switched through the four magnetic states to produce two electrical pulses in the sensor for each of the magnetic elements for each revolution of the rotor.

14. (Amended) The pulse transducer of claim 1, wherein the rotor of the pulse transducer is driven through a magnetic pickup that is magnetically coupled to rotation of a corresponding magnetic driver in a flow meter.

Remarks

In the Office Action of December 19, 2001, a new ground of rejection was issued for claims 1-11 and 14 under 35 U.S.C. §103(a) as being obvious when Boden, U.S. Pat. No. 4,398,773 was taken in view of Kurihara et al. (U.S. Pat. No. 5,707,753). Even taking the most that is disclosed by these two references and combining them, one does have the resulting subject matter recited in claim 1.

Considering Kurihara et al. first, this patent shows Barkhausen-type wires. In Kurihara, the unique aspect is that these wires are bent into a curved position and this bent position is used to characterize the pulses generated in a test arrangement. The invention in Kurihara does not exploit or explain (except when discussing the prior art), the nature of Barkhausen-type wires in having a core and an exterior magnetic portions. Thus, for purposes of the present invention, Kurihara is no more relevant than any reference showing Barkhausen devices.

The Office Action misreads claims 1-11 on Boden.

Claim 1, as amended, provides as follows:

1. A pulse transducer, comprising:

a rotor having an axis of rotation and having a plurality of magnetically switchable elements spaced around the axis and

movable along a path of travel around the axis, each of said magnetically switchable elements having at least four magnetic states;

a sensor disposed adjacent said rotor for carrying magnetically produced electrical pulses;

two magnets disposed adjacent said sensor to produce magnetic fields of opposite polarity along the path of travel for the plurality of magnetically switchable elements; and

wherein as said rotor is rotated, said two magnets cause each of said magnetic elements to be magnetically switched through the four magnetic states to produce two electrical pulses in the sensor for each of the magnetic elements for each revolution of the rotor.

If elements 4 in Boden are magnetic elements, first, they are not Barkhausen-type devices and second they are not spaced "around the axis" (claim 1) but are spaced along the axis of rotation.

Fig. 2 in Boden is a function of axial displacement. Magnetic elements 4 in Fig. 4 of Boden are not "spaced" around the axis; instead, they completely encircle the axis. Because they are not spaced around the axis, they do not move along a path of travel around the axis as recited in claim 1; again, they surround the axis at all times. In Boden, the relationship of permanent magnets 4 with permanent magnetic elements 3 is such that they are used to detect axial displacement of the rotor of a meter. Through electric control, the rotor is urged back against the direction of fluid flow which is tending to cause the axial displacement. It is difficult to see what relevance this axial position sensor and correction system has with the present rotational pulse transducer.

It is respectfully submitted that Boden and Kurihara do not, in combination, disclose or suggest any of the highlighted subject matter in claim 1.

Only the present invention provides a switching of two magnetic elements four times to produce at least two pulses for

each revolution of the rotor. (Summary of the Invention, page 3, lines 3-5).

For similar reasons, the cited art does not in combination provide the subject matter in claim 2 either. There is no rotation which would produce ten (10) pulses for five (5) magnetically switched elements.

From what has been said above, it should also be apparent that since Boden doesn't show spaced magnetic elements around its axis, these elements are not equally and angularly spaced around the axis of rotation as recited in claims 3 and 5.

Claims 7 and 8 claim the feature wherein the two magnets are positioned diametrically across the rotor. In Boden the two magnets 3 encircle the rotor and are spaced axially along the rotor.

Regarding claims 13 and 15, these were rejected under 35 U.S.C. §103 (a) over Boden in view of Kurihara in further view Evans et al., U.S. Pat. No. 4,200,785. Evans was cited as showing a pulse transducer for a meter register as applied to a gas pump. It should now be apparent that none of the references besides Evans teaches a pulse transducer. Therefore, the rejection should have been based on Evans in view of the other references. There is no teaching, however, that truly connects the device in Boden to the device in Evans.

Evans already has a pulse transducer in which N and S permanent magnetic elements (Fig. 3) are arranged around a wheel or a disc which is rotated past a reed switch that is switched by the N and S magnetic elements. Evans does not provide a plurality of magnetically switchable elements in a rotor, meaning an element that switches between two or more magnetic states in response to magnetic flux.

With respect to the rejection of claim 14, claim 14 has been amended to make clear that the pulse transducer is driven through the a magnetic pickup responding magnetically to a driver in the flow meter. The pulse generator of the present invention provides low drag and torque on the driving elements (specification, page 2, lines 25-32) and this is not disclosed in the cited prior art.

B

Conclusion

Claim 1 has been amended to distinguish from an axial displacement position sensor in Boden. The prior art rejections are believed to incorrect for the reasons stated above. After the amendment claims 1-15 are still pending and a Notice of Allowance for these claims is respectfully requested.

Respectfully submitted,

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B

Appendix-Amended Claims with Changes Marked

IN THE CLAIMS:

Please amend claim 1 as follows:

1. (Twice Amended) A pulse transducer, comprising:

a rotor having an axis of rotation and having a plurality of magnetically switchable elements spaced around [its] the axis [and rotatable] and movable along a path of travel around the axis, each of said magnetically switchable elements having at least four magnetic states;

a sensor disposed adjacent said rotor for carrying magnetically produced electrical pulses;

two magnets disposed adjacent said sensor to produce magnetic fields of opposite polarity along the path of travel for the plurality of magnetically switchable elements; and

wherein [further characterized in that] as said rotor is rotated, said two magnets cause each of said magnetic elements to be magnetically switched through the four magnetic states to produce two electrical pulses in the sensor for each of the magnetic elements for each revolution of the rotor.

14. (Amended) The pulse transducer of claim 1, wherein the rotor of the pulse transducer is driven through [coupled to] a magnetic pickup [for responding] that is magnetically coupled to rotation of a corresponding magnetic driver in a flow meter.